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ABSTRACT

A project produced a high technology status report providing needs assessment data for educational planning. The purpose was to determine the impact and future of high technology in Louisiana. Information was obtained from 68 Louisiana manufacturing industries by mailed questionnaire. Data indicated that 45 industries were involved in high tech. A majority of the industries were involved in high technology through the use of Computer-Aided Drafting (CAD) Equipment; they becamne involved in high technology as a method to increase production. Information was collected on types of computer hardware and software packages, Computer Numerical Control (CNC) equipment and software packages, CAD equipment and software packages, and industrial robots used. When Louisiana industries recruited for high technology positions, most required either a B.S. in engineering or industrial technology. More internal or in-house training and vendor training were needed by industry to implement high technology. A future high tech educational requirement by industry was projected for trained individuals, preferably in the area of CAD. Most industries anticipated one to five new positions. Important CAD competencies were use and understanding of terminology and application of basic drafting techniques, important CNC competencies were knowledge of machining processes and familiarity with hardware and operation, and robot safety was viewed as very important. (YLB)

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HIGH TECHNOLOGY NEEDS ASSESSMENT

PROJECT DIRECTOR
JAMES R. OWENS, PH.D.

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FOREWORD

This Research Guide, High Technology Needs Assessment, was produced as a result of a project funded by the Louisiana State Department of Education to Southeastern Louisiana University. This Model Unit represents the concerted efforts of Industrial Education teachers throughout the State of Louisiana. This Unit has been field tested and evaluated.

We believe that this Guide will make a major contribution to the improvement of instruction in Industrial Education in Louisiana.

Thomas G. Clausen

Thomas G. Clausen, Ph.D.
State Superintendent of Education

ACKNOWLEDGEMENTS

This needs assessment represents the cooperative efforts of personnel in the Industrial Technology Department, Southeastern Louisiana University, and the Office of Vocational Education, Louisiana State Department of Education. Special recognition goes to the Louisiana University Industrial Education Departments, faculty members and chairmen. Another highly significant contributor to this project was the Louisiana Department of Commerce. Also, a special commendation goes to the Louisiana Manufacturing Industries who worked so diligently to make the publication a reality.

Elaine Webb, Ed.D.
Assistant Superintendent
Office of Vocational Education
Louisiana Department of Education

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ABSTRACT

The goal of this project was to conduct a high tech status report providing needs assessment data for educational planning. The purpose of the study was to determine the impact and future of high technology in Louisiana.

The descriptive method of research using the mailed questionnaire was utilized. Information was obtained from 68 Louisiana manufacturing industries.

The data received indicated that most, or 45, of these industries are involved in high tech. A majority of the industries are involved in high technology through the use of Computer-Aided Drafting Equipment. A large majority of the industries became involved in high tech as a method to increase production.

Most industries use IBM mainframe and personal computers with Cobol or Fortran languages and Lotus or Data Base software packages.

Mazak, Cincinnati Milacron and Bridgeport Computer Numerical Control Equipment and Fanuc or Compact II software packages are most popular.

Most industries use IBM Computer-Aided Drafting Equipment and the Auto-Cad software package. The GMF and ASEA industrial robots are the most popular.

When Louisiana industries recruit for high technology positions, most require either a B.S. in Engineering or

Industrial Technology. More internal or in-house training and vendor training is needed by industry in order to implement high technology. A future high technology educational requirement by industry will be for trained individuals preferably in the area of CAD. Of the industries that are involved with high tech, most anticipate one to five new positions.

The CAD competencies which are most important involve the utilization and understanding of terminology and the application of basic drafting techniques. Knowledge of machining processes and familiarity with hardware and operation of computer controlled machines is of considerable importance to industry regarding CNC. Industry views robot safety as of great importance. Of considerable importance, too, is teach pendent programming.

CHAPTER 1

Introduction

Since 1980, high technology and related industries have developed rapidly in the United States. The declining oil and gas industry plus other economic factors have caused Louisiana to actively recruit such industry to meet present and future employment needs. However, the attraction and maintenance of high technology development requires effective communication between these industries and educational institutions. Therefore, it is the responsibility of the educational system to provide its graduates with relevant skills and knowledge for gainful employment.

Statement of the Problem

What is the impact and future of high technology in Louisiana? The purpose of the project was to conduct a "high tech" status report providing needs assessment data for educational planning.

Purpose of the Research Study

The purpose of the study was to attain the following

Objectives:

1. To determine what high technology industries are located in Louisiana (industries that utilize Computer-Aided Drafting, Computer Numerical Control and Robotics).
2. To establish what equipment, computer hardware and related software is utilized by these high tech industries for production and training.
3. To establish what equipment, computer hardware and related software is needed by the Louisiana University Industrial Education Departments (Industrial Arts/Technology Education) for high tech instruction and VTIE inservice requirements.

Need for the Study

The Southeastern Louisiana University Department of Industrial Technology has acquired a considerable amount of state-of-the-art equipment that specifically addresses high technology as defined in Section 400.4 of the Carl D. Perkins Act. In conjunction with a significant capital outlay for equipment, the Department is in the final stages of a total curricular revision. National data banks were researched and some valuable training materials secured. However, these materials must be adopted and/or adapted to meet our individual needs. Thus, an immediate needs assessment must be conducted to determine the status of high technology in our state to provide

us direction. We have some information, but it is rather fragmented. Through our business and industry advisory council, we have identified "islands of innovation." Through recent interaction with the Louisiana Department of Commerce and Industry, it was determined that the high tech status issue is a problem. The latter is anxious to assist in data acquisition, as soon as the population can be identified.

Needs assessment information secured through this study will help determine the necessary training and/or retraining of industry personnel and university instructional staff in order to implement high technology educational programs. Equipment, computer hardware and software information is extremely important because of the significant cost and intensive training that is involved. If we in vocational education are to teach about and serve high tech industries, we must communicate! Equipment and computers are our vehicles of instruction and are their means of productivity.

Data acquired through this study will:

1. Assist Louisiana in expanding, improving, modernizing, and developing quality vocational educational programs in order to meet the needs of the existing and future work force for marketable skills; and to improve productivity and promote economic growth.

2. Promote greater cooperation between public agencies and the private sector in preparing individuals for employment, in promoting the quality of vocational education in Louisiana, and in making the vocational system more responsive to the labor market.
3. Provide vocational education services to train, retrain, and upgrade employed and unemployed workers in new skills for which there is a demand.

Definition of Terms

Computer-Aided Drafting (CAD) - The use of computers in interactive engineering drawings and storage of designs.

Computerized Numerical Control (CNC) - A numerical control system wherein a dedicated, stored computer program is used to perform some or all of the basic numerical control functions.

Curriculum - A systematic group of courses or sequences of subjects required for graduation or certification in a major field of study.

Robotics - The study of reprogrammable, multifunctional manipulators designed to move materials, parts, tools or specialized devices through variable programmed motions for the performance of a variety of tasks.

Technology Education - A comprehensive curricular area which has an action-based instructional program concerned

with technology, its evolution, utilization, and significance; with industry, its organization, personnel, systems, techniques, resources, and products; and their combined social and cultural impacts.

Delimitations

This study was limited to manufacturing industries located within the geographic boundaries of Louisiana. Any industry that employed 250 or more people was included in the study population (Appendix A). In addition to the 150 potential respondents identified from the 1986-87 Edition of the Directory of Louisiana Manufacuturers, 44 names and addresses of the industrial participants were furnished by Industrial Advisory Councils and equipment, tool or supply vendors (see Appendix B). Thus, the study population included 68 of a potential 194 industries that were contacted. The decrease in the total possible number of respondents may have been due to the depressed economic conditions that existed within the State of Louisiana during the survey period. Information requested on the survey instrument was designed to furnish statistical data to the universities and the Louisiana State Department of Education.

Assumptions

The underlying assumptions of this study were:

1. The instrument was valid and reliable.
2. The questionnaire was understood, marked and scored properly.
3. The contact persons' responses were honest.

CHAPTER II

Procedure

The purposes of this chapter are to describe the methods used in developing the survey instrument and to explain the procedure used in conducting the survey. The information is discussed in the following sequence:

1. Development of the instrument
2. Testing of the instrument
3. Selection of the study population
4. Collection of the data
5. Analysis of the data

Development of the Instrument

Related studies, state and national curricular networks, periodicals, professional organizations, and books on research were reviewed to ascertain the most appropriate type of instrument to use in the study. This search of the related literature revealed that no standardized tests or instrument exist. It was decided by the investigator that it would be best to construct an instrument sensitive to the population being surveyed.

The mailed questionnaire was chosen because of greater contact possibilities and its low cost when compared with other methods of study. The questionnaire is not a quick and easy method of investigation. It is, however, a primary method for

data gathering in descriptive survey studies and can gather and secure data from a widely scattered source. The questionnaire was designed to obtain maximum information while requiring minimal effort and time from the respondents. The questionnaire was constructed to include both checklists and free response or "open end" questions. Checklists were included for ease of operation and to speed up recording of the data. Open end questions were included on the instrument so that respondents had the opportunity to submit additional or supplemental information.

Testing the Instrument

Upon completion of the rough draft, the preparer called upon University faculty members to examine the questionnaire for accuracy, clarity, and nomenclature. Suggestions were given and revisions were made. The revised questionnaire was then field-tested by a jury of 12 professionals. Half of the jury was composed of teacher educators with varied experience and employment backgrounds. The remaining six jury members were employed in industry with varied levels of experience. Upon completion of the questionnaire, the members of the jury were asked for comments pertaining to time consumed, general appearance, ease of operation, clarity, directions, interpretation and suggestions for improvement. Following the tabulation of results, revisions were made and the final draft was printed (Appendix C).

Selection of the Study Population

Industry addresses were obtained from the 1986-87 edition of the Directory of Louisiana Manufacturers published by the Louisiana Department of Commerce. A letter stating the purpose of the study was sent to the Secretary for Commerce and Industry requesting industry addresses. As a result, company names and addresses of industrial manufacturers were received. Self-adhesive mailing labels for each industry with executive names and titles were also obtained. Additional industry names and addresses were secured through contact with Industrial Advisory Council members and equipment vendors. A compilation of these industries and their location is listed in Appendix B.

Collection of the Data

Accompanying each questionnaire were both a letter of transmittal and a stamped, self-addressed return envelope. The letter of transmittal (see Appendix D) briefly explained the importance of the study, the purpose of the study, and questions for which answers were sought. The letters were signed by the investigator and printed on university letterhead stationery. This was done to demonstrate to the industries that the study was supported by Southeastern. The letters also stated that each respondent would receive a summary of the research findings. A stamped, self-addressed return envelope plus additional questionnaires were included in the mailings because research has shown that the response rate is higher when this method is used.

At the end of three weeks, 26 or 13.4 percent of the questionnaires had been returned. A follow-up mailing (Appendix E) was then sent to the remaining nonrespondents. The follow-up increased the returnees to 48 or 24.7 percent. A third follow-up was conducted six weeks after the initial mailing (see Appendix F). This final follow-up increased the total number of returned questionnaires to 68 or 35 percent.

Analysis of the Data

As the questionnaires were received, information was recorded according to its nature and type of response. Names and addresses of industries and contact representatives were recorded for future departmental use. Forms listing employers, employees and positions were completed and filed for future reference and study. Data received from "open end" or free response questions were categorized and recorded. The tabular responses from the completed instruments were processed utilizing the Statistical Package for the Social Sciences (SPSS). An analysis of means and percent of raw totals was utilized to interpret the data. The presentation of the data primarily involved frequencies and percentages. All data were tabled for graphic representation and included narrative summaries.

CHAPTER III

Presentation and Interpretation of Data

The previous chapters were concerned with identification of the problem and procedures used to collect data for this study. The purpose of this chapter is to present statistical analysis and interpretation of the data collected. An explanation of data interpretation and results is presented in the following sections:

1. Industries that are involved in High Technology
2. Minimum Competencies for Computer-Aided Drafting (CAD)
3. Minimum Compentencies for Computer Numerical Control (CNC)
4. Minimum Compentencies for Robotics

As indicated in Chapter I, questionnaires were sent to a total of 194 manufacturing industries, and 68 or 35 percent of the industries responded. In order to determine the status of high technology involvement of Louisiana manufacturing industries, they were asked: "Are you involved in high technology, yes or no?" Data in Table 1 reflect the number and percentages of responses to that questionnaire item.

TABLE 1

Industry Involvement in High Technology

Direction of Response	No.	Percent
Industries responding "Yes"	45	66.2
Industries responding "No"	21	30.9
Other	2	2.9
TOTAL	68	100.0

A positive response of "yes" was indicated by 66.2 percent of the industries surveyed. Twenty-one or 30.9 percent of the industries responded that they were not. Of these 21 industries, six planned to be involved in high tech within the next three years. Only two industries indicated that they did not care to participate in this research study; they declined because of economic reasons.

Industries That Are Involved in High Technology

In order to ascertain the extent to which manufacturing industries within Louisiana are involved in high technology, the industries were asked to indicate which area or areas. It is the purpose of this section to present data relevant to the characteristics of those 45 respondents. Table 2 reveals that a majority of the industries (55.6 percent) is involved in Computer-Aided Drafting.

TABLE 2

Industry Involvement in High Technology by Area

Areas	No.	Percent
Computer-Aided Drafting (CAD)	25	55.6
Computer Numerical Control (CNC)	21	51.1
Process Control	11	24.4
Industrial Robotics	10	22.2
Management Information Services	3	6.7
Modeling and Stress Analysis	2	4.4
Machine Vision	1	2.2
Programmable Controller	1	2.2
TOTAL	74	100.0

Twenty-one responses were for Computer Numerical Control as a high tech area of concentration. The third largest area listed by the respondents (24.4 percent) was that of process control. Robotics was indicated by 10 respondents as their area of high tech involvement and represented 22.2 percent of the responses. The Management Information Services area accounted for 6.7 percent of the responses as an area of high technology involvement. The remaining three areas of modeling and stress analysis, programmable controllers and machine vision accounted for less than 10 percent of the responses.

Data found on Table 3 indicate that a large majority, 86.7

percent, of the surveyed industries became involved in high technology as a method to increase production.

TABLE 3

Reasons for Involvement in High Technology

Justification	No.	Percent
A Method to Increase Production	39	86.7
To Improve the Quality of a Product	31	68.9
To Reduce Costs	6	13.3
Because of Competition	3	6.7
Problem Solving/Efficiency	1	2.2
TOTAL	80	100.0

Thirty-one responses (68.9 percent) indicated that their involvement began as a method to improve product quality. Cost reduction was indicated by 13.3 percent of the responses. The areas of competition, problem-solving and efficiency accounted for less than 10 percent of the industry responses to the question.

Question number three of the survey questionnaire concerned the utilization of a mainframe computer. Thirty-three industries (73.3 percent) responded "yes" and 12, or 26.7 percent, of the industries responded "no" to this question. Data found in Table 4 indicate that a slight majority, or 51.5 percent of the industries utilize an IBM Mainframe Computer. Ten respondents (30.3 percent) indicated the use of Digital Hardware.

TABLE 4

Utilization of Mainframe Computers

Hardware	No.	Percent
IBM	17	51.6
Digital	10	30.3
Hewlett-Packard	2	6.1
Burroughs	1	3.0
Perkin-Flmer	1	3.0
Univac	1	3.0
Wang	1	3.0
TOTAL	33	100.0

Two industries, or 6.1 percent, reported that Hewlett-Packard was being utilized. The remaining four kinds of computers listed in Table 4 were used by four different industries.

In conjunction with the utilization of a mainframe computer, industries were surveyed regarding languages used. As indicated by the data found in Table 5, Cobol was listed by 16 industries, Fortran by 15 industries, and use of both accounts for 59.7 percent of the responses.

TABLE 5

Computer Language(s) Used

Language	No.	Percent
Cobol	16	30.8
Fortran	15	28.9
Basic	9	17.4
RPG	3	5.8
Hewlett-Packard	2	3.8
PL/1	2	3.8
Datatrieve	1	1.9
Pascal	1	1.9
Perkin- Elmer	1	1.9
Ramis	1	1.9
Univac	1	1.9
TOTAL	52	100.0

The third most frequent response (9 or 17.4 percent) to this survey item was Basic. The eight remaining languages listed account for less than 25 percent of the total responses.

All industries that reported involvement in high technology also responded that they use a personal computer. Table 6 is used to present data relative to responses concerning the kinds used. IBM was listed by 56.1 percent of the industries as the kind of

personal computer used, and this percentage represents a clear majority of the responses. The Apple personal computer was the

TABLE 6

Utilization of Personal Computers

Hardware	No.	Percent
IBM	37	56.1
Apple	10	15.2
Hewlett-Packard	4	6.1
Wang	4	6.1
AT&T	3	4.5
Leading Edge	2	3.0
Tandy	2	3.0
Compaq	1	1.5
Digital	1	1.5
Texas Instruments	1	1.5
Olivetti	1	1.5
Total	66	100.0

second most frequently mentioned and accounts for 10 of the 66 responses (15.2 percent). Hewlett-Packard and Wang both represent 6.1 percent each of the industry responses. The remaining seven personal computers listed in Table 6 account for less than 17 percent of the data reported.

In conjunction with the utilization of personal computers, industries were surveyed regarding what software packages were used. Data found in Table 7 indicate that 27.3 percent of the

respondents were using Lotus software. Data Base was reported by 11, or 16.7 percent of the industries. Symphony software, the third most frequent choice, was listed by six respondents. The software packages Word Processor and Word Star were named by 10

TABLE 7

Software Package(s) used

Software	No.	Percent
Lotus	18	27.3
Data Base	11	16.7
Symphony	6	9.1
Word Processor	5	7.6
Word Star	5	7.6
Auto Cad	4	6.1
Spreadsheet	4	6.1
Wordperfect	3	4.5
Basic	2	3.0
Displaywriter	2	3.0
Fortran	2	3.0
Appleworks	1	1.5
Multiplan	1	1.5
Pascal	1	1.5
Visicalc	1	1.5
TOTAL	66	100.0

industries, five each, as the kind they used. Auto Cad and Spreadsheet were the choices of eight industries for a total of 12.2 percent of the responses (6.1 percent each). The remaining software packages listed in Table 7 accounted for less than 20 percent of the total responses recorded for this questionnaire item.

Computer Numerical Control equipment and software was the subject of question number five of the survey instrument. Twenty-three industries responded that they were involved in high technology through the use of Computer Numerical Control equipment. According to the data represented in Table 20, most industries (20.6 percent) utilize Mazak equipment. A total of six respondents, three each, indicated use of Bridgeport and Cincinnati Milacron equipment. A majority of the industries, 13 out of 24, responded that they used 13 different kinds of Computer Numerical Control equipment. This group accounted for a collective majority of the responses (54.6 percent).

TABLE 8

Utilization of Computer Numerical Control Equipment

Kind	No.	Percent
Mazak	5	20.6
Bridgeport	3	12.4
Cincinnati Milacron	3	12.4
Allen Bradley	1	4.2
Cybermation	1	4.2
Excello	1	4.2
Foxboro	1	4.2
General Electric	1	4.2
Honeywell	1	4.2
Hurco	1	4.2
Kearney	1	4.2
Monarch	1	4.2
Moniseiki	1	4.2
Sunstrand	1	4.2
Toyoda	1	4.2
Wiedeman	1	4.2
TOTAL	24	100.0

The second component of question number five on the survey instrument pertained to accompanying software. Data in Table 9 were based upon the 13 responses received.

TABLE 9

CNC Software Package(s) Used by Industry

Software	No.	Percent
Fanuc	5	38.4
Compact II	2	15.4
APT	1	7.7
Computervision	1	7.7
Mazitron	1	7.7
Oxytechnic	1	7.7
Spades	1	7.7
Video Spec	1	7.7
TOTAL	13	100.0

The software package "Fanuc" was listed by five industries, representing 38.4 percent of the responses. Compact II accounted for 15.4 percent of the total number of responses. These data represented 53.8 percent of the responses received. The remaining six software packages named by an equal number of industries comprised 46.2 percent of the total number of responses to this questionnaire item.

"What type of Computer-Aided Drafting equipment do you utilize?" was the sixth question asked of industries involved in high technology. The data in Table 10 indicate 42.9 percent of the industry responses were IBM. The second most frequent response recorded was five, which accounted for 17.8 percent of

TABLE 10

Utilization of Computer-Aided Drafting Equipment

Kind	No.	Percent
IBM	12	42.9
Autotrol	5	17.8
Hewlett-Packard	3	10.7
Compaq	2	7.1
Tektronix	2	7.1
Calcomp	1	3.6
Computervision	1	3.6
Digital	1	3.6
Intergraph	1	3.6
TOTAL	28	100.0

responses to this questionnaire item. Three industries reported the use of Hewlett-Packard equipment. Compaq and Tektronix with two responses each accounted for 14.2 percent of the responses. The remaining four types of Computer-Aided Drafting equipment represented less than 15 percent of the industry responses.

An analysis of the data in Table 11 indicates that a

majority of the responses (52.6 percent) concerning Computer-Aided Drafting software were Auto-Cad.

Table 11

CAD Software Package(s) Used by Industry

Software	No.	Percent
Auto-Cad	11	52.6
Intergraph	3	14.5
AGW II	1	4.7
Aycad	1	4.7
CADKEY	1	4.7
CADAM	1	4.7
Calcomp	1	4.7
Design Graphix	1	4.7
Digital	1	4.7
TOTAL	21	100.0

Three respondents indicated use of Intergraph. The remaining seven software packages listed in Table 11 totaled 32.9 percent of the responses received on this questionnaire item.

The third area of high technology surveyed was Robotics. Data located in Table 12 indicate that three, or 30 percent, of the robots used in the surveyed industries are GMF. Twenty percent of the robots in service are ASEA. Noteworthy is the fact that the

remaining five, or 50 percent, of the total responses were for five different kinds. Two software packages were listed as being used in conjunction with these robots; they were VAL II and KAREL.

TABLE 12

Utilization of Robotic Equipment

Hardware	No.	Percent
GMF	3	30
ASEA	2	20
Allen Bradley	1	10
Cybotech	1	10
Prab	1	10
Unimation	1	10
Zymark	1	10
TOTAL	10	100

Industry respondents were asked to state current educational requirements concerning high tech positions. As indicated by the data in Table 13, most industries required either a B.S. in

TABLE 13

High Technology Educational Requirements

Degree	No.	Percent
B.S., Engineering	30	42.9
B.S., Industrial Technology	19	27.1
Associate Degree	15	21.4
M.S., Engineering	3	4.3
B.S., Accounting	1	1.4
B.S., Math	1	1.4
M.S., Computer Science	1	1.4
TOTAL	70	100.0

Engineering (42.9 percent) or a B.S. in Industrial Technology (27.1 percent). Fifteen respondents indicated that an associate degree was required. Only four responses, or 5.7 percent, indicated that a graduate degree was necessary for fulfilling the educational requirements for employment in a high technology position in Louisiana industry.

In order to ascertain current training needs, researchers asked industries to report the training necessary to implement high technology programs. The data in Table 14 represents those findings. These data indicate that internal or in-house training is needed by five industries, and five responses were for vendor training. Three responses, or 13.7 percent, expressed a need for manufacturer training which is closely related to the need for

TABLE 14

Current High Technology Training Needs

Training Needs	No.	Percent
Internal/in-house Training	5	22.8
Vendor Training	5	22.8
CNC Workshop	3	13.7
Manufacturer Training	3	13.7
PLC Programming Workshop	2	9.0
Programmable Controller Workshop	2	9.0
CAD Workshop	1	4.5
Electrical Workshop	1	4.5
TOTAL	22	100.0

vendor training. Also receiving attention was a need for workshops in CNC (13.7 percent), programmable/programming (18 percent), and both CAD and electrical (9 percent). industries were also requested to submit data relative to future educational requirements concerning high tech positions.

"Trained individuals" was the most common response (38.7 percent) recorded concerning this issue as referenced in Table 15. CAD coursework was the next most frequent response. Five, or 27.7 percent, of the responses were for this requirement. The remaining six responses (5.6 percent each) varied. All 18

TABLE 15

Future High Technology Educational Requirements

Requirements	No.	Percent
Trained Individuals	7	38.7
CAD Coursework	5	27.7
CNC Coursework	1	5.6
Computer Literate	1	5.6
Computer Programming	1	5.6
Programmable Controller Training	1	5.6
Robotics Training	1	5.6
Vendor Training	1	5.6
TOTAL	18	100.0

responses concerned future educational requirements for employment within Louisiana high technology industries. The final question asked of the industry respondents was: "What are your future personnel projections for new positions?" According to the data in Table 16, 64.5 percent of the industries responding indicated growth will justify the need to add between one and five new positions. Based upon the 20

responses to this item, 20 to 100 positions could be projected.

TABLE 16

Future Personnel Projections

New Positions	No.	Percent
1-5	20	64.5
6-10	6	19.4
11-25	3	9.7
26-50	1	3.2
More than 100	1	3.2
TOTAL	31	100.0

Another 60 positions could be projected from the third most frequent response which accounted for 19.4 percent of the total responses. According to the data in Table 16, a minimum of 215 and a maximum of 385 new positions can be projected based upon the total responses received.

Minimum Competencies for Computer-Aided Drafting (CAD)

Page three of the questionnaire (Appendix C) contained 17 Computer-Aided Drafting Competencies. Industries were requested to identify the importance of each competency. The directions regarding this request are found in Appendix on page 2 of the survey instrument. A five-point scale was provided, making use of the following key: (1) No importance, (2) Little importance, (3) Moderate importance, (4) Considerable importance, and (5) Great importance. To aid in the

interpretation of mean scores on any of the 17 competencies, the following classification scheme is presented:

TABLE 17

Classification Guide to Interpret CAD Competencies

Range	Score	Description
1-1.5	1	No Importance
1.51-2.5	2	Little Importance
2.51-3.5	3	Moderate Importance
3.51-4.5	4	Considerable Importance
4.51-5	5	Great Importance

Table 18 provides mean values for each of the 17 competencies. Responses from the 29 industries that utilize CAD were recorded and compiled.

TABLE 18

Minimum Competencies for Computer-Aided Drafting

Competencies	Mean Rating
Accurately utilize and understand terminology associated with CAD.	4.06
Demonstrate a knowledge of basic drafting techniques, including orthographic projection and the alphabet of lines.	4.10
Demonstrate command use on a CAD system and the steps for placing linear, circular and angular dimensions.	3.79
Understand and draw circles and arcs through two and three points, tangent to entities.	3.72
Identify the method used to select commands on a CAD system and utilize the device used to make a menu selection.	3.68
Have a working knowledge of the steps required for initializing commands to the CAD system using the keyboard.	3.68
Understand and perform various intersections of lines and planes.	3.65
Start up and stop a CAD system properly plus use a floppy or a hard disc system to save work done on a terminal.	3.55
Establish coordinates, either relative, absolute or polar.	3.51
Generate basic geometric constructions using macro commands.	3.51
Demonstrate the rotation, mirroring and zoom functions on a CAD system.	3.48
Utilize at least two input devices used to enter information in a computer and perform basic drafting functions.	3.48
Utilize text parameters (modifiers) to customize a command for a specific application.	3.41
Demonstrate basic skills in the creation of a plot file and utilize common pictorial library symbols.	3.34
Determine if a system has geometric tolerancing symbols and demonstrate how such symbols are placed on a drawing.	3.34
Have an understanding of default values, text font and the many variations for labels that can be user controlled.	3.27
Be familiar with the procedure for activating the digitizing of existing drawings and input necessary coordinate points for digitizing a drawing.	3.10

n = 29

BEST COPY AVAILABLE

The competency which pertained to the accurate utilization and understanding of terminology associated with CAD received the highest rating (4.06). The lowest-rated competence concerned procedures for activating the digitizing of existing drawings and coordinate points for digitizing drawings. The mean rating for this competency was 3.10. Ten competencies received a mean rating of 3.51 or more and can be classified as having considerable or great importance. Of the remaining seven competencies, none were identified as being less than moderately important.

Minimum Competencies for Computer Numerical Control (CNC)

Pages three and four of the questionnaire (Appendix C) contained Computer Numerical Control Competencies. As with CAD, industries were asked to identify the importance of each of the 14 CNC competencies. The Classification Guide introduced in Table 17 can be used to aid in the interpretation of mean scores. Data submitted from the 25 industries that are currently involved with Computer Numerical Control are presented in Table 19.

TABLE 19

Minimum Competencies for Computer Numerical Control (CNC)

Competencies	Mean Rating
Have knowledge of machining processes, feed rates, and spindle speeds.	4.36
Be familiar with the hardware, controls, feedback systems, and in general, how computer controlled machines operate.	4.00
Know the rectangular coordinate system, absolute and incremental positioning, and axes relationship.	3.84
Write a part program with a computer using user-friendly software.	3.78
Be familiar with the tooling used on computer numerical control machines and the physics of chip removal.	3.72
Program and operate a computer numerical control turning center.	3.68
Know the mathematics, codes and definitions necessary to determine cutter diameter compensation and movement.	3.64
Program and operate a computer numerical control machining center.	3.64
Have a conceptual understanding of computer-aided manufacturing systems, and their effect on future industrial capabilities.	3.56
Know tape coding, specifications, and format.	3.36
Write a part program using linear or circular interpolation.	3.36
Write a part program with the computer by using interactive graphics.	3.33
Know the basic elements of a computer-assist language, and write a program utilizing the language.	3.31
Access and process programs on timeshare computing equipment.	2.79

n = 25

Feed rates and spindle speeds were rated as the highest competency (4.36) in attaining knowledge of machining processes according to the data in Table 19. To access and process programs on timeshare computing equipment received the lowest rating, 2.79. This rating was not below the lower end of the moderately important range according to the classification guide introduced in Table 17. Nine of the 15 CNC competencies can be classified as having either considerable or great importance.

Minimum Competencies for Robotics

Responses from the 10 industries in Louisiana that utilize robots were analyzed and data presented in Table 20. The highest-rated competence (4.60) according to the industry responses was: "Be aware of the potential safety hazards associated with robot installations and apply loss prevention techniques." To be able to operate a robot via a HOST computer received the lowest rating, 3.10. A significant majority, 16 out of 17 competencies, received a mean rating of 3.50 or above.

TABLE 20

Minimum Competencies for Robotics

Competencies	Mean Rating
Be aware of the potential safety hazards associated with robot installations and apply loss prevention techniques.	4.60
Be able to program a robot through the use of a teach pendent.	4.10
Have a working knowledge of what computer intergrated manufacturing is.	4.00
Know the importance of defining a HOME position for the robot.	4.00
Identify check valves, accumulators and cylinders plus relate their basic operation and typical application.	3.90
Demonstrate a successful understanding of electronic test equipment when servicing and trouble shooting robotic equipment.	3.80
Demonstrate an understanding of the factors used in planning a robot installation.	3.80
Identify regulators, flow valves, boosters, and sequence valves that are found in a typical pneumatic system and relate their basic operation and typical application.	3.80
Apply the terminology associated with robot applications.	3.70
Know the action of components in a control system in terms of ON or OFF (Yes/No) decisions.	3.70
Develop technical automation devices to interface with a robot.	3.70
Know the basic operation of transmitting energy through a pneumatic power system.	3.60
Utilize a vocabulary of basic electrical terms used in microprocessor electronics.	3.60
Analyze the variety of applications of industrial robots.	3.50
Know the basic operation of transmitting force and energy through a hydraulic system.	3.50
Provide flow charts/diagrams of layout or re-layout of facilities necessary for flexible manufacturing.	3.50
Be able to operate a robot via a HOST computer.	3.10

n = 10

CHAPTER IV

Summary, Conclusions and Recommendations

Administrators, counselors, vocational teachers and the industrial sector must work together to develop the most valuable resource we have, people. To be successful, it is most important that technology and industry are understood and that there is cooperation from all involved in the education process. Before this can happen, needs must be identified, understood, and resolved between personnel in industry and education. Thus, the intent of this study was to determine technology needs of industry and education within the State of Louisiana.

Summary

The main purpose of this study was to determine the impact and future of high technology in Louisiana. The goal of the project was to generate a high tech status report providing needs assessment data for educational planning. To more clearly define the goal and purpose of this study, the following major objectives were established: (1) to determine what high technology industries are located in Louisiana; (2) to establish what equipment, computer hardware and related software is utilized by these industries; and (3) to establish what equipment, computer hardware and related software is needed for education.

The descriptive method of research using the mailed questionnaire was utilized in this study. Information was obtained from 68 Louisiana manufacturing industries.

Data were recorded according to their nature and type of response. Name and current addresses of the industries and contact persons responding were recorded. Forms listing employers, employees and positions were completed. Descriptive analysis, numbers and percentages, mean ratings, graphic representation and narrative summaries were made of the data. Findings of the study are concluded in the following paragraphs.

Conclusions

Of the 68 industries that responded to the survey, most (45) are involved in high technology. A majority of the industries is involved through the use of Computer-Aided Drafting Equipment. A large majority of the industries became involved in high technology as a method to increase production. Most industries use an IBM mainframe computer and either Cobol or Fortran programming languages. A majority of the industries also use IBM personal computers in conjunction with Lotus or Data Base software packages. When an industry utilizes Computer Numerical Control equipment, most of the time it chooses Mazak, Cincinnati Milacron or Bridgeport. The CNC software packages most often used are Fanuc and Compact II. Most industries select IBM Computer-Aided Drafting equipment and a majority utilize Auto-Cad software. When industries decide to purchase a robot, most of them select the GMF or ASEA brands.

When Louisiana industries recruit for high technology positions, most require a B.S. in either Engineering or Industrial Technology. More internal or in-house training and vendor training is needed by industry in order to implement high technology. A future high technology educational requirement by industry will be for trained individuals, preferably in the area of CAD. Of the industries that are involved with high tech, most anticipate one to five new positions.

The CAD competencies which are most important involve the utilization and understanding of terminology and the application of basic drafting techniques. Knowledge of machining processes and familiarity with hardware and operation of computer controlled machines are of considerable importance to industry regarding CNC. Industry views robot safety as a great importance. Of considerable importance, too, is teach pendent programming.

Recommendations

Based on the analysis of the responses to the survey questionnaire and the findings and conclusions of this study, the following recommendations are presented:

1. Conduct research concerning the reasons why more industries in Louisiana are not involved in high technology.
2. Closer contact should be maintained between educational institutions and all industry.
3. The feasibility of offering high tech in-service training at Louisiana Universities should be studied.
4. Resource people from industry should be utilized in the university program of instruction.
5. Use information obtained regarding high tech competencies to upgrade course and curricular requirements.
6. Disseminate the findings of this research study to all segments of the educational community that have an interest in technology.
7. A committee to conduct periodic follow-up studies of this needs assessment should be appointed.
8. CAD, CNC, and robotics equipment and software that are primarily used in industry should also be used in education.
9. Summer faculty internship positions within Louisiana high tech industry should be established.

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APPENDIX A

LARGEST LOUISIANA MANUFACTURERS

LARGEST LOUISIANA MANUFACTURERS*
(By number of employees)

5000-Plus	
AT&T Consumer Products	Shreveport
Avondale Shipyards, Inc.	Avondale
2500-4999	
Dow Chemical, U.S.A., Louisiana Div.	Plaquemine
General Motors, Assembly Div. of GM Corp.	Shreveport
Martin Marietta Aerospace	New Orleans
1000-2499	
Citgo Petroleum Corporation	Sulphur
Ditto Apparel of California, Inc.	Colfax
Exxon Chemical Americas	Baton Rouge
International Paper Company	Bastrop
Libbey Glass, Div. of Owens-Illinois, Inc.	Shreveport
Manville Forest Products Corporation	West Monroe
Martin Mills, Inc.	Saint Martinville
McDermott Marine Const. Fabrications Div.	Amelia
Morton-Thiokol/Louisiana Division	Doyline
Olin Corporation	Lake Charles
PPG Industries, Chemicals Division	Lake Charles
J.H. Rutter-Rex Manufacturing Co., Inc.	New Orleans
Shell Oil/Shell Chemical Co.-Norco Complex	Norco
Tri-State Oil Tool Industries, Inc.	Bossier City
Union Carbide Corporation, Taft Plant	Taft
500-999	
American Cyanamid Company	Waggaman
Amstar Corporation	Arabi
Avondale Shipyards, Offshore Division	Morgan City
BASF Wyandotte	Geismar
Bayou Steel Corporation	Laplace
Borden, Inc.-Borden Chemical Division	Gonzales
CIBA-Geigy Corporation, Inc.	Saint Gabriel
Conoco, Inc.	Westlake
Copolymer Rubber & Chemical Corporation	Baton Rouge
Crown Zellerbach Corporation	Bogalusa
Crown Zellerbach Corporation	Saint Francisville
Cy/RO Industries, Inc.	Westwego
Dresser Industries, Industrial Valve Ops.	Tioga
E.I. du Pont de Nemours & Company, Inc.	Laplace
Exxon Company, U.S.A.-Baton Rouge Refinery	Baton Rouge
General Electric Company	Shreveport

General Motors, Fisher Guide Division	Monroe
Georgia Gulf Corporation	Plaquemine
Georgia-Pacific Corp., Port Hudson	Zachary
HIMONT U.S.A. Inc.	Lake Charles
Houma Industries, Inc.	Harvey
Jeanerette Mills Inc.	Jeanerette
J.R.A. Apparel Mfg., Inc.	Bastrop
Kaiser Aluminum & Chemical Company	Gramercy
Monsanto Company	Luling
Occidental Chem. Corp., Ind. & Spec. Chem.	Taft
Ormet Corporation	Burnside
PBR Offshore Marine Corporation	Morgan City
Pellerin Milnor Corporation	Kenner
Port Allen Marine Service, Inc.	Brusly
Riley-Beaird	Shreveport
Service Machine Group, Inc.	Morgan City
Shell Chemical Co.-Geismar Plant	Geismar
Stone Container Corporation	Hodge
Stone Container Corporation, Bag Division	Hodge
Teledyne Movible Offshore, Inc.	Amelia
Tenneco Oil Processing & Marketing	Chalmette
J.M. Tull Metals Company	Kenner
Wembley Industries, Inc.	New Orleans

250-499

Agrico Chemical Company	Donaldsonville
Allied Corp. Plastics & Functional Chem.	Baton Rouge
Amax Nickel Inc.	Braithwaite
American Marine Corporation	New Orleans
American Standard, Inc.	New Orleans
Arcadian Corporation	Geismar
Atlas Processing Company	Shreveport
Avondale Shipyards, Westwego Division	Westwego
Baker CAC, Inc.	Belle Chasse
Bancroft Bag, Inc.	West Monroe
Bell Aerospace Textron	New Orleans
Bell Halter Inc.	New Orleans
Boise Cascade Corporation	Florien
Boise Cascade Corporation, Timber & Wood	Florien
Boland Marine & Manufacturing Co., Inc.	New Orleans
Bollinger Machine Shop & Shipyard, Inc.	Lockport
B.P.Oil Inc.	Alliance
CBS Toys/Gym-Dandy	Bossier City
The Celotex Corporation	Marrero
CF Industries, Inc.	Donaldsonville
Chevron Chemical Company	Belle Chase

Cit-Con Oil Corporation	Lake Charles
Crowley Manufacturing Company Inc.	Crowley
Deansgate, Inc.	New Orleans
Dibert, Bancroft & Ross Company, Ltd.	Amite
Ditto Apparel of California, Inc.	Leesville
Dixie Machine Welding & Metal Works, Inc.	New Orleans
Dunham Manufacturing Company, Inc.	Minden
Eckco Fabricators, Inc.	Big Branch
Edmont	Haynesville
Evans Cooperage Company Inc.	Harvey
Firestone Synthetic Rubber and Latex Co.	Lake Charles
Freeport Chemical Company	Convent
Freeport Sulphur Company	Port Sulphur
Frymaster Corporation	Shreveport
Garan, Inc.	Church Point
Garber Industries	Broussard
Gemoco, a Chromalloy Company	Houma
Genstar Roofing Products	Shreveport
GNB Inc.	Shreveport
W. R. Grace & Co., Davison Chemical Div.	Sulphur
Halter Marine Inc.	New Orleans
Hydril Company	Harvey
Hydril Company	Westwego
International Minerals & Chemical Corp.	Sterlington
International Moorings & Marine, Inc.	New Iberia
International Paper Company	Mansfield
International Paper Company	Pineville
International Paper Company	Springhill
Jantzen, Inc.	Eunice
Jennings Manufacturing Company	Jennings
Justiss Oil Company, Inc.	Jena
Kaiser Aluminum & Chemical Corporation	Baton Rouge
Kast Metals Corp., Mid-Continent Div. II	Shreveport
Kast Metals Corp., Mid-Continent Steel Div.	Shreveport
LaSevilla Fashions, Inc.	Columbia
LaSevilla Fashions, Inc.	Winnsboro
Laurens Glass Company, Inc.	Simsboro
LEEVAC Shipyards	Jennings
Louisiana Concrete Products, Inc.	Baton Rouge
Louisiana Pacific Corporation	Urania
Malter International Corporation	Gretna
Manville Forest Products Corporation	Joyce
Manville Forest Products Corporation	West Monroe
Marathon Petroleum Co.-Louisiana Refining	Garyville
McDermott Inc., Amelia Shipyard Div.	Amelia
McDermott Inc., New Iberia Shipyard Div.	New Iberia
McDermott Marine Const. Bayou Black	Gibson
Mechanical Equipment Company, Inc.	New Orleans

Morton-Thiokol, Inc.	New Iberia
Nabors Trailers, Inc.	Mansfield
Neese Industries, Inc.	Gonzales
Raymond Fabricators, Inc.	Houma
Red Fox Industries, Inc.	New Iberia
Rubicon, Inc.	Geismar
J.H. Rutter-Rex-Manufacturing Co., Inc.	Franklinton
Sea-Con Services, Inc.	New Iberia
SFE Technologies	New Orleans
Siemens-Allis, Inc.	New Orleans
Standard Fittings Company	Opelousas
Sunbeam Appliance Company, Coushatta Div.	Coushatta
Swiftships, Inc.	Morgan City
Texaco Inc.-Louisiana Plant	Convent
TK Valve & Manufacturing Inc.	Hammond
Todd Shipyards Corporation	New Orleans
Uniroyal Chemical	Gonzales
UOP Inc. Process Division	Blanchard
Vista Chemical Co., Lake Charles Chemical	Westlake
Vulcan Chemicals	Geismar
Willamette Industries, Inc.	Campti
Willamette Industries, Inc.	Zwolle

*Total = 150

APPENDIX B

SUPPLEMENTAL INDUSTRY NAMES AND ADDRESSES

LOUISIANA INDUSTRIES AND ADDRESSES

Benoit Machine
Box 1419
Houma, La. 70360

Boland Marine
P.O. Box 53287
New Orleans, La. 70153

Casing Service of La.
P.O. Box 716
Port Allen, La. 70767

Coastal Tubular Service
P.O. Box 3619
Morgan City, La. 70381

Crossover, Inc.
P.O. Box 819
Independence, La. 70443

Custom Die & Insert
P.O. Box 53673
Lafayette, La. 70505

Directional Drilling
P.O. Box 2056
New Iberia, La. 70560

Ericksen Machine
30 Commerce Court
Harahan, La. 70183

Glesco, Inc.
P.O. Box 249
Belle Chasse, La. 70037

La. Tool & Die
4828 Choctaw St.
Brusly, La. 70719

Global Oil Tools
Box 3580
Houma, La. 70361

Gulf South Machine
P.O.Box 268
Ponchatoula, La. 70454

H J M Machine Inc.
129 Industrial Avenue
Jefferson, La. 70121

Hub City Iron Works
P.O. Box 2697
Lafayette, La. 70502

Hydril Co.
P.O. Box 1029
Westwego, La. 70094

Iberia Machine Inc.
P.O. Box 1235
New iberia, La. 70560

Industrial Parts
P.O. Box 45041
Baton Rouge, La. 70895

Intracoastal Parts Inc.
P.O. Box 354
Harvey, La. 70059

K & B Machine Works
P.O. Box 1597
Houma, La. 70361

La Forge Inc.
P.O. Box 568
Opelousas, La. 70570

Precision Industries
10421 Mammoth Street
Baton Rouge, La. 70814

Oilfield Tool & Die
P.O. Box 31854
Lafayette, La. 70503

Pump Services
P.O. Box 1818
West Monroe, La. 71291

Semon Machine
315 E. Pecan Avenue
Shreveport, La. La. 71106

Pellerin-Milnor
P.O. Box 400
Kenner, La. 70063

Standard Fittings
P.O. Box 1268
Opelousas, La. 70570

Gould Pumps, Inc.
P.O. Box 964
Denham Springs, La. 70726

Brown and Root U.S.A., Inc
Norco, La. 70079

Cooper Energy Services
P.O. Box 8840
Metairie, La. 70011

Gulf South Laboratories, Inc.
339 W. Harrison
New Orleans, La. 70124

Power Packing Co.
P.O. Box 52915
Baton Rouge, La. 70805

Otis Engineering
P.O. Box 9598
New Iberia, La. 70560

Quality Machine
12742 Ronaldson Road
Baton Rouge, La. 70807

Service Foundry
P.O. Box 53254
New Orleans, La. 70153

Prager Inc.
472 Howard Ave.
New Orleans, La. 70130

Sturm Machine
P.O. Box 1242
West Monroe, La. 71291

Tools International
P.O. Box 52323
Lafayette, La. 70501

Triumph Drilling
P.O. Box 52721
Lafayette, La. 70505

Tube Alloy Corp.
P.O. Box 3016
Houma, La. 70361

Tubular Threading
P.O. Box 520
Marrero, La. 70072

W K M Wellhead
P. O. Drawer 1095
Shreveport, La. 71102

Walker Mfg. Co.
Rt. 3, Box 970
Walker, La. 70785

Dibert, Bancroft, & Ross Co, Ltd.
Amite, La. 70422

Technical Compression Services, Inc.
2206 Engineers Rd.
Belle Chasse, La. 70037

APPENDIX C

SURVEY QUESTIONNAIRE

HIGH TECH NEEDS ASSESSMENT

DEPARTMENT OF INDUSTRIAL TECHNOLOGY
SOUTHEASTERN LOUISIANA UNIVERSITY
P.O. BOX 847-S.L.U.
HAMMOND, LA 70402

Company/School Name:_____

Address:_____ City:_____

Contact Person:_____ Phone Number:_____

HIGH TECH STATUS QUESTIONNAIRE:

1. Are you involved in High Technology? [ ] Yes [ ] No

   If yes, in which of the following areas: [ ] Computer-Aided Drafting (CAD) [ ] Computer Numerical Control of Machines (CNC) [ ] Robotics [ ] Other_____

   If No, do you plan to in the next: [ ] year [ ] 3 years [ ] 5 years [ ] Other_____

2. How did you become involved in High Technology? [ ] State incentives [ ] Federal Grant [ ] A method to increase production [ ] To increase the quality of your product [ ] Other_____

3. Do you utilize a mainframe computer? [ ] Yes [ ] No

   If yes, what kind: [ ] I.B.M. [ ] Honeywell [ ] Other_____ _____ and what language(s): [ ] Basic [ ] Cobol [ ] Fortran [ ] Other_____

4. Do you utilize a personal computer? [ ] Yes [ ] No

   If yes, what kind(s): [ ] I.B.M. [ ] TI [ ] Apple [ ] Other_____ and what software packages:_____ _____

5. What type of Computer Numerical Control (CNC) equipment do you utilize? [ ] Bridgeport [ ] EMCO [ ] Other_____ and what software package(s):_____

6. What type of Computer-Aided Drafting (CAD) equipment do you utilize? [ ] Tektronix [ ] I.B.M. [ ] Other_____ and what software package(s):_____

7. What type of Robotic equipment do you utilize? [ ] Cincinnati Milacron [ ] ASEA [ ] Rhino [ ] Other _____ and what software package(s):_____

8. What are your current educational requirements concerning "High Tech" positions? [ ] Associate degree [ ] B.S. Industrial Tech [ ] B.S. Engineering [ ] Other_____

9. What are your present training needs necessary to implement high technology programs? Ex.: CNC Workshop

10. What are your future educational requirements concerning "High Tech" positions? Ex.: CAD coursework

11. What are your future personnel projections for new positions? [ ] 1-5 [ ] 6-10 [ ] 11-25 [ ] more than 100 [ ] Other _____

IDENTIFICATION OF MINIMUM COMPETENCIES FOR HIGH TECHNOLOGY

Directions: The scale on this page is designed to assist you in arriving at a numerical value on the items in the subsequent listing.

VALIDITY OR CONFIDENCE SCALE

Numerical Scale	
Blank	NO JUDGMENT -No knowledge to judge this item.
1	NO IMPORTANCE -Competency not needed. -Not required. -Worthless.
2	LITTLE IMPORTANCE -Nice to know but of little value. -Other competencies of greater value.
3	MODERATE IMPORTANCE -Desirable to acquire if time permits.
4	CONSIDERABLE IMPORTANCE -Not essential but of great value to acquire during college program.
5	GREAT IMPORTANCE -Essential that competency be acquired during college program. -Unqualified unless competency acquired.

MINIMUM COMPENTENCIES FOR COMPUTER-AIDED DRAFTING (CAD)

Directions: Please rate each item by placing a circle around the number that best represents your opinion of the item's importance.

		NO IMPORTANCE	LITTLE IMPORTANCE	MODERATE IMPORTANCE	CONSIDERABLE IMPORTANCE	GREAT IMPORTANCE
1.	Accurately utilize and understand terminology associated with CAD.	1	2	3	4	5
2.	Start up and stop a CAD system properly plus use a floppy or a hard disc system to save work done on a terminal.	1	2	3	4	5
3.	Utilize at least two input devices used to enter information in a computer and perform basic drafting functions.	1	2	3	4	5
4.	Identify the method used to select commands on a CAD system and utilize the device used to make a menu selection.	1	2	3	4	5
5.	Demonstrate a knowledge of basic drafting techniques, including orthographic projection and the alphabet of lines.	1	2	3	4	5
6.	Generate basic geometric constructions using macro commands.	1	2	3	4	5
7.	Understand and draw circles and arcs through two and three points, tangent to entities.	1	2	3	4	5
8.	Understand and perform various intersections of lines and planes.	1	2	3	4	5
9.	Utilize text parameters (modifiers) to customize a command for a specific application.	1	2	3	4	5
10.	Have an understanding of default values, text font and the many variations for labels that can be user controlled.	1	2	3	4	5
11.	Demonstrate command use on a CAD system and the steps for placing linear, circular and angular dimensions.	1	2	3	4	5
12.	Determine if a system has geometric tolerancing symbols and demonstrate how such symbols are placed on to a drawing.	1	2	3	4	5
13.	Be familiar with the procedure for activating the digitizing of existing drawings and input necessary coordinate points for digitizing a drawing.	1	2	3	4	5
14.	Demonstrate basic skills in the creation of a plot file and utilize common pictorial library symbols.	1	2	3	4	5
15.	Have a working knowledge of the steps required for initializing commands to the CAD system using the keyboard.	1	2	3	4	5
16.	Establish coordinates, either relative, absolute, or polar.	1	2	3	4	5
17.	Demonstrate the rotation, mirroring and zoom functions on a CAD system.	1	2	3	4	5

MINIMUM COMPETENCIES FOR COMPUTER NUMERICAL CONTROL (CNC)

1.	Have knowledge of machining processes, feed rates, and spindle speeds.	1	2	3	4	5
2.	Be familiar with the tooling used on computer numerical control machines and the physics of chip removal.	1	2	3	4	5
3.	Be familiar with the hardware, controls, feedback systems, and in general, how computer controlled machines operate.	1	2	3	4	5

4.	Know the rectangular coordinate system, absolute and incremental positioning, and axes relationships.	1 2 3 4 5
5.	Know tape coding, specifications, and format.	1 2 3 4 5
6.	Know the mathematics, codes and definitions necessary to determine cutter diameter compensation and movement.	1 2 3 4 5
7.	Write a part program using linear or circular interpolation.	1 2 3 4 5
8.	Write a part program with a computer using user-friendly software.	1 2 3 4 5
9.	Write a part program with the computer by using interactive graphics.	1 2 3 4 5
10.	Know the basic elements of a computer-assist language, and write a program utilizing the language.	1 2 3 4 5
11.	Program and operate a computer numerical control turning center.	1 2 3 4 5
12.	Program and operate a computer numerical control machining center.	1 2 3 4 5
13.	Access and process programs on timeshare computing equipment.	1 2 3 4 5
14.	Have a conceptual understanding of computer aided manufacturing systems, and their effect on future industrial capabilities.	1 2 3 4 5

MINIMUM COMPETENCIES FOR ROBOTICS

1.	Analyze the variety of applications of industrial robots.	1 2 3 4 5
2.	Apply the terminology associated with robot applications.	1 2 3 4 5
3.	Demonstrate an understanding of the factors used in planning a robot installation.	1 2 3 4 5
4.	Be aware of the potential safety hazards associated with robot installations and apply loss prevention techniques.	1 2 3 4 5
5.	Provide flow charts/diagrams of layout or re-layout of facilities necessary for flexible manufacturing.	1 2 3 4 5
6.	Utilize a vocabulary of basic electrical terms used in microprocessor electronics.	1 2 3 4 5
7.	Be able to program a robot through the use of a teach pendant.	1 2 3 4 5
8.	Demonstrate a successful understanding of electronic test equipment when servicing and trouble shooting robotic equipment.	1 2 3 4 5
9.	Be able to operate a robot via a HOST computer.	1 2 3 4 5
10.	Know the action of components in a control system in terms of ON or OFF (Yes/No) decisions.	1 2 3 4 5
11.	Know the basic operation of transmitting force and energy through a hydraulic system.	1 2 3 4 5
12.	Identify check valves, accumulators and cylinders plus relate their basic operation and typical application.	1 2 3 4 5
13.	Know the basic operation of transmitting energy through a pneumatic power system.	1 2 3 4 5
14.	Identify regulators, flow valves, boosters, and sequence valves that are found in a typical pneumatic system and relate their basic operation and typical application.	1 2 3 4 5
15.	Know the importance of defining a HOME position for the robot.	1 2 3 4 5
16.	Develop technical automation devices to interface with a robot.	1 2 3 4 5
17.	Have a working knowledge of what computer integrated manufacturing is.	1 2 3 4 5

APPENDIX D

INITIAL LETTER OF TRANSMITTAL

Southeastern Louisiana University
UNIVERSITY STATION
HAMMOND, LOUISIANA
70401

June 11, 1986

TO: High Technology Industries

FROM: James R. Owens, Ph. D., Department of Industrial Technology, Southeastern Louisiana University

YOUR HELP IS NEEDED! I am directing two Industrial Technology projects this summer. The first, "Working Women in Louisiana Industry", involves the development of a media presentation that features women employed in non-traditional careers. Your assistance is needed to identify any females that are currently employed in your industry. (Please complete Form A.) I plan to follow-up with these individuals and visit them at their work place if possible. My goal is to conduct a brief interview with them and film typical job activities. The purpose of this project is to encourage females in Louisiana to consider industrial careers which have been traditionally held by males. The materials produced by this project will become a recruitment tool for counselors seeking female participation in vocational education and as a resource for the Centers for Displaced Homemakers.

The second project is a needs assessment to address the impact and future of high technology in Louisiana. The purpose of this project is to conduct a "High Tech" status report providing needs assessment data for educational planning. The research objectives are:

-To determine what high technology industries are located in Louisiana (industries utilizing Computer-Aided Drafting, Computer Numerical Control or Robotics).

-To establish what equipment, computer hardware and related software is utilized by these "high tech" industries for production and training.

-To establish what equipment, computer hardware and related software is needed for high tech instruction at Louisiana Industrial Education (Industrial Arts/Technology Education)Departments.

I am requesting that each Industry complete the High Tech Status Questionnaire based upon your equipment. Also, I would appreciate it if each Department with CAD, CNC, and/or Robotics capabilities please complete the applicable competencies profile(s).

Your answers to the enclosed questionnaire will be reported in statistical terms and respondents will receive a summary of the research findings. To aid you in completing this questionnaire, I have enclosed a self-addressed stamped envelope.

Thank you for your cooperation and assistance in this matter.

Enclosure

JRO:mll

APPENDIX E

SECOND FOLLOW-UP LETTER

Southeastern Louisiana University
UNIVERSITY STATION
HAMMOND, LOUISIANA
70401

July 2, 1986

Personnel, High Technology Industries:

We have been called to a state of awareness as reinforced by President Reagan in his 1983 State of the Union Address. He alerted us to keep our "technological edge" in the world economic environment. He went on to say "We need to begin renewing the basics, starting with our educational system." Since 1980, high technology and related industries have developed rapidly in the United States. The declining oil and gas industry plus other economic factors have caused Louisiana to actively recruit such industry to meet present and future employment needs. However, the attraction and maintenance of high technology development requires effective communication between these industries and educational institutions. Therefore, it is the responsibility of the educational system to provide its graduates with relevant skills and knowledge for gainful employment.

You were recently sent the attached correspondence soliciting your input regarding our research. Information secured through this research study will help determine the necessary training and/or retraining of industry personnel and university instructional staff in order to implement high technology educational programs. Equipment, computer hardware and software information is extremely important because of the significant cost and intensive training that is involved. If we in education are to teach about and serve "High Tech" industries, we must communicate! Equipment and computers are our vehicles of instruction and are your means of productivity.

PLEASE DON'T MISS THIS OPPORTUNITY TO PROVIDE DIRECTION!

Sincerely,

James R. Owens, PH.D.
Department of Industrial Technology
Southeastern Louisiana University

APPENDIX F

THIRD FOLLOW-UP LETTER

Southeastern Louisiana University
UNIVERSITY STATION
HAMMOND, LOUISIANA
70401

July 9, 1986

Plant Management, High Technology Industries

Since 1980, high technology-related industries have developed rapidly in the United States. The declining oil and gas industry in Louisiana has caused this state's leaders to actively recruit "high tech" industry. However, the success of such a venture depends to a degree upon a well-trained labor market. That is, persons with knowledge and the skills must be available in sufficient numbers. Although some specific on-the-job training is usually expected, an industry and the state can profit greatly if there is a minimal amount of training required to perform the work needed. Therefore, it is the responsibility of an educational system to be sensitive to this, and respond by providing its students with relevant skills and knowledge for employment.

Recently, you were sent a questionnaire soliciting your input regarding our research on the topic of High Technology Training Needs in Louisiana. As your response has not been received yet, we are enclosing a duplicate of the original correspondence for your completion. Information secured through this research study will help determine the necessary training and/or retraining of personnel in order to implement educational programs for the expanding high technology sector. Selecting the correct classroom equipment, and computer hardware and software is all extremely important because of their significant cost, the intensive training required, and today's decreasing budgets. If we are to teach about and serve High Tech Industries, we need your input! Equipment and computers are our vehicles of instruction, and are your means of productivity.

If you have already responded to this study, I thank you. If not, won't you take a moment and do so? If you have any questions or comments, please contact me at 549-2189. Respondents to this survey will receive a complimentary copy of this survey's results.

Sincerely,

James R. Owens, PH.D.
Department of Industrial Technology
Southeastern Louisiana University